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Introduction

Interest in contingent academic labor has increased, especially after recent studies reporting that graduation rates fall with increases in the percentage of an institution's faculty hired on a part-time or non-tenure track basis (Ehrenberg & Zhang, 2005; Jacoby 2005). So far however, there has been little quantitative research on the determinants of demand and supply for part-time academic labor. In this study we look at employment patterns at public community colleges; it is among these institutions that we find the most intensive use of part-time faculty.

This paper makes four distinct contributions. We advance the existing literature regarding the demand for part-time faculty by providing estimates of the mean annual earnings for part-time faculty by institution. Second, our estimates facilitate a theoretically appropriate estimate of the supply and demand for part-time faculty. Third, the study considers whether high production of graduate students increase part-time faculty employment in community colleges. Finally, the study informs the on-going debate over whether the inclusion of part-time faculty within collective bargaining units has a significant impact upon college employment practices.

Literature

Researchers have speculated why it is that part-time faculty employment, which stood at 23% of all faculty in the 1970s, has risen to 46% of all faculty today (AAUP, 2006). Ehrenberg (2002) argues that a reduction in state aid for public higher education institutions has been an important contributing factor. That conclusion has been controversial, especially among administrators who argue that part-time employment is not utilized primarily as an austerity measure, but is instead an appropriate management technique to bring expertise from professionals to their campuses, and also to cope with administrators' need to flexibly respond to changing student demands (Wagoner, 2008; Green, 2008).

Only one reported study has attempted to quantitatively investigate why employment patterns differ among higher education institutions. Conducting a cross-section analysis of four-year colleges and universities, Liu and Zhang (2007) found that for every 10% increase that schools pay their full-time faculty, the ratio of part-time to full-time instructors rises by about 1%. They also find that, on average, part-time faculty ratios in urban schools are 6% greater than those found elsewhere. Finally, they also find that schools with higher annual revenue devote a portion of those funds to lower their reliance upon part-time faculty employment.

A second concern for which there is now only scant research concerns the roles that unions play with respect to part-time faculty. As part-time academics increasingly turn toward organizing, this subject has become the subject of caustic debate (Wagoner, 2007). The majority of part-time faculty who join labor organizations affiliate themselves with full-time faculty in existing unions. Some, however, question the value of such affiliation. They believe instead that unions dominated by full-time faculty fail to aggressively represent part-time interests. According to this view, unions protect the wages, benefits and security of their privileged members--the full time faculty--while sacrificing the interests of their non-tenure track colleagues (Hoeller, 2004; Ruiz, 2008; Yoshioka, 2008).

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Dobbie and Robinson (2007) use data from the Directory of the National Center for Collective Bargaining in Higher Education to compare rates of unionization between the U.S. and Canada. They find that while Canada has higher faculty union density, the U.S. has lower rates of part-time faculty usage. Their research suggests that one explanatory element overlooked is whether part-time faculty are involved in union activity. In a few cases part-time faculty have set up independent bargaining units. Dobbie and Robinson's findings indicate that older unions may do less to restrict part-time employment, while newer units—those more likely to have part-time faculty involved—are more successful in curbing growth in part-time employment. The current state of this debate provides grist for both sides, with findings indicating that older-style unions are indeed more likely to protect the wages of their full-time members, and thereby create incentives for colleges to hire more part-time faculty. However, if newer bargaining units succeed in improving wages and working conditions for part-time faculty while continuing their efforts on behalf of full-time faculty, the result could be to limit demand for part-time faculty.

What is clear is that part-time faculty are paid low wages. In 2004, the AAUP reported that the median wage for teaching one course was roughly $3,000 among doctoral institutions and $1,675 within community colleges. We find high variation in per course pay, as the 25th percentile of community colleges pay just under $1,400 and the 75th percentile $2,250 per course (AAUP, 2004). Making the situation more difficult is the fact that few part-time instructors are eligible for health, pension and other benefits. Such benefits are usually contingent upon half-time employment. While many part-time instructors teach the equivalent of a 50% time, their work may be spread out, disqualifying them for benefits with a single employer.

Based on its National Study of Post-Secondary Faculty (NSOPF:2004), the National Center for Educational Statistics reports that the average part-time instructor in any higher educational facility earned an $11,000 basic salary from their institution plus an additional $900 for other responsibilities (Cataldi & Bradburn, 2004). Community college part-time faculty instructional earnings were even lower; they received $9,200 plus an additional $800 for other duties in 2003-04. Many, if not most, community college faculty earn income from other sources; on average, their institutional earnings were a little less than one-fourth the $44,800 mean total income reported among part-time faculty. Earnings vary substantially by field, with instructors in the health sciences receiving more than twice the wages ($22,000) institutions paid instructors in education and the fine arts ($9,800, and 9,900 respectively).

Data

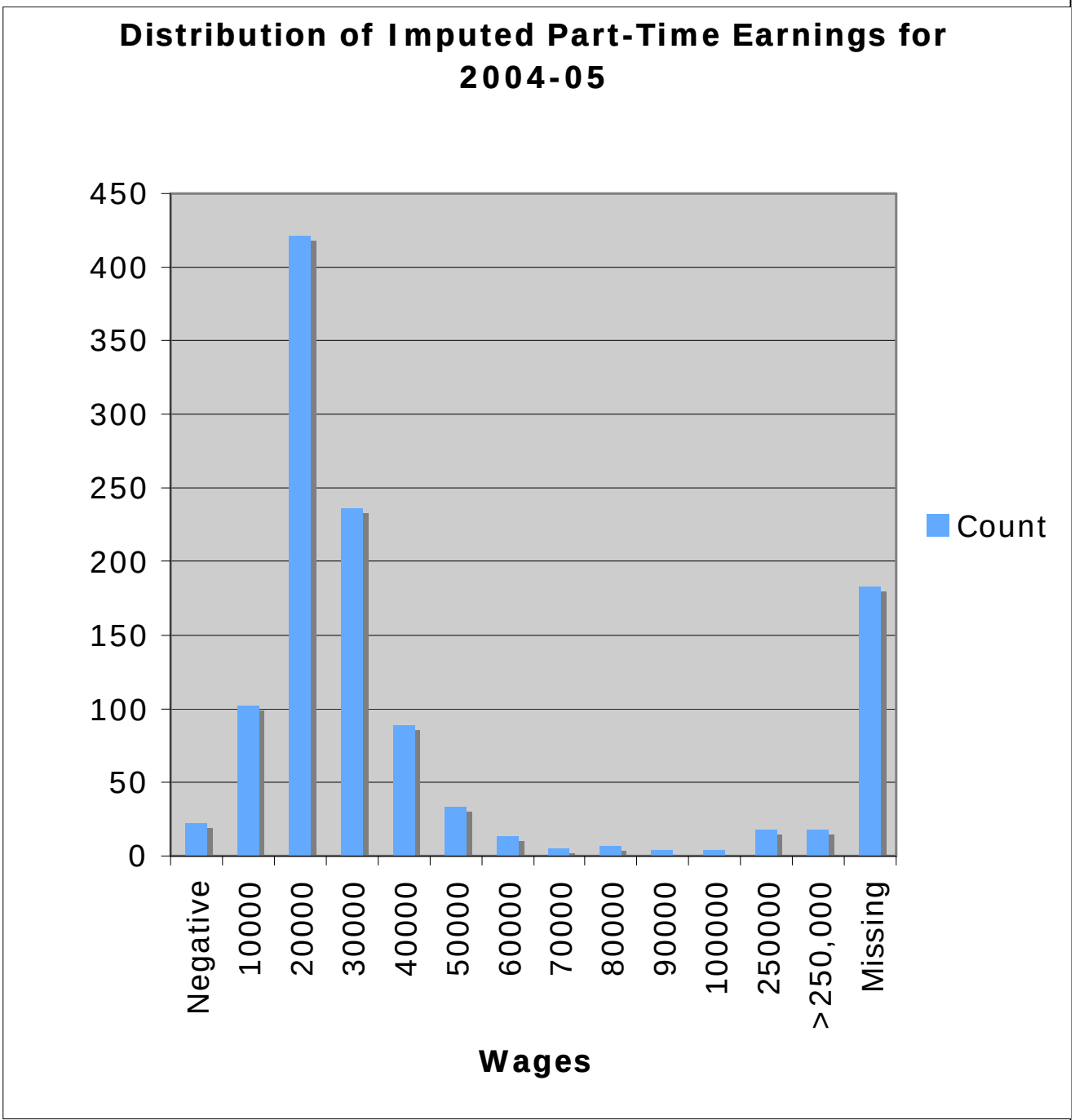
One of the most persistent obstacles confronting researchers on part-time or contingent academic labor has been the lack of reliable data on wages and salaries. There have been no successful surveys to collect this data by institution. The annual AAUP faculty salary survey has not yet succeeded in developing institutional averages for part-time faculty. The NSOPF estimates discussed above are based on samples drawn from many institutions, but these samples are too small to provide accurate estimates for individual schools. This paper deploys hitherto unused financial data from the NCES's Institutional Post-secondary Education Database [IPEDS] to calculate the mean annual part-time faculty wages at individual community colleges.

IPEDS collects and makes available individual college data for total instructional wage and salary expense. It also collects total compensation data on full-time faculty. Conceptually, subtracting the latter from the former generates a good estimate of expenditures on part-time faculty. Unfortunately, there are a number of challenges involved in using this data to construct reliable estimates. Most importantly, it is clear that reporting problems detract from the quality of this NCES data. Notably, some schools fail to report total instructional compensation, while others report figures that are simply unbelievable. Nonetheless, careful elimination of identifiably unreliable data yields plausible total part-time faculty compensation for roughly 70% of the public community colleges on record for the academic year 2004-05. One cross check with regard to the data's reliability involves its correlation with part-time utilization rates, which is reported later in this paper.

The most common data defect involves the failure by institutions to report total instructional wages and salaries, or to report that this figure is zero. Of 1,154 we were unable to obtain sufficient data to make any part-time wage estimate for 183 schools. Among the remaining 971 institutions, the data produced

negative earnings at 22 schools which were not credible. Figure 1 shows the distribution of calculated mean annual earning for part-time faculty by institutions. We calculated these earning to be between 0 and 20000 for 523 schools (53.9% of the sample for which earnings were derived. 78.2% of institutional earnings scores were between 0 and 30,000.

Figure 1



Source: Author's calculations using NCES Data

Schools that are disproportionately oriented towards trade instruction are notably more likely to be associated with such cases. For the year 2004 we define institutions as trade-oriented when arts and science subject related degrees are less than a third of the institution's total associates degrees. As indicated in Table 1, among those institutions at which calculated mean part-time earnings were under $50,000, we see that schools with high trade or technical subject enrollment representation were underrepresented (33%). Their proportion rises to 54% among the 68 schools where annual part-time wages are calculated to be greater than $50,000. Their proportion rises to 59% among schools for which missing data prevented any estimate, and 80% among the 22 schools for which the estimates were negative. We are uncertain why this relationship exists, but suspect that different accounting procedures in such schools are responsible.

Table 1:
Percentage of Part-time Wage Calculations With Suspect Relationships

Calculated PT Wage	***n***	**% Parent-Child**	**%Trade School**
0-50000	881	9.53%	32.89%
>50000	68	14.71%	54.41%
Negative	22	22.73%	79.78%
Missing	183	64.48%	59.09%

A second variable also occurs more frequently among schools for which calculated part-time wages either can't be constructed or appear out-of-range. Schools that share a data reporting relationship (parent or child relationships) with another institution are also disproportionately represented as we move away from expected mean earnings for an institution. Parent-child relationships account for 65% of the non-reported data, whereas schools whose estimates are near to expected values—under $50,000—have parent-child relationships in fewer than 10% of our cases. Among the 68 schools where calculated part-time faculty earnings over $50,000, the proportion of parent-child relationships rises was 15%, and for schools where calculations produced negative earnings, it was 22%.

The analyses in this study are conducted so as to include more and less expansive groups of cases that permit informed judgments regarding the impact of earnings calculations that appear to be out of range. In virtually all instances our findings gain significance with the inclusion of additional data, and parameter estimates for most variables are only modestly changed. We do not, however, use any cases in which calculated part-time earnings were negative or greater than $100,000, thus eliminating 58 cases. Accordingly, all analyses are run using three groups. These consist of all cases in which part-time earnings were calculated less than $25,000, 50,000 and 100,000.

Table 2 reports the statistical descriptions for the variables in this study. The table makes it clear that mean values for most variables change only modestly as we extend the groups to include cases in which higher part-time wages were calculated. Clearly, this is not the situation for the mean value of Part-Time Wages, which must by definition rise as we include cases with higher values. The same statement is also true with respect to ratio of part to full-time wages. Part-time wages rise from 33% to 46% as we move from groups that include only those with part-time wages under $25,000 to the larger group in which the calculations for these wages are under $100,000. The lack of significant change in the other variables suggests that analyses conducted involving these cases are affected only to the extent that there may be bias in the part-time faculty wage measurement.

We note that calculations for part-time faculty earnings, and for the part-time faculty ratio, rely upon NCES reports of staff employment and expense data. Financial data is reported more fully in odd years while faculty employment data is reported more fully in even years. Thus, to calculate the level of employment among part and full-time faculty for the 2004-05 year, we averaged 2003-04 and 2005-06 staffing levels in order to increase case size. Averaging these two years appears to produce greater reliability, as data occasionally varied considerably between the three years.

TABLE 2
Selected Descriptive Statistics

Variable	PT Wage	*N*	Mean	Std. Dev.
PART-TIME FACULTY RATIO	≤ 25K	668	0.6869	0.11717
	≤ 50K	881	0.6581	0.12693
	≤ 100K	914	0.6472	0.13969
	ALL CASES	1053	0.6107	0.19331
RATIO OF PART-TIME WAGE TO FULL-TIME WAGE	≤ 25K	641	0.3291	0.12299
	≤ 50K	851	0.413	0.21366
	≤ 100K	883	0.4548	0.31427
	ALL CASES	934	0.8654	4.66265
SCHOOL HAS COLLECTIVE BARGAINING UNIT (1=yes, 0=no)	≤ 25K	668	0.3	0.46
	≤ 50K	881	0.34	0.473
	≤ 100K	914	0.33	0.471
	ALL CASES	1129	0.29	0.453
PART-TIME FACULTY INCLUDED IN UNION (1=yes, 0=no)	≤ 25K	668	0.1886	0.3915
	≤ 50K	881	0.2304	0.42134
	≤ 100K	914	0.2287	0.4202
	ALL CASES	1154	0.1941	0.39568
PART-TIME STUDENT PERCENTAGE	≤ 25K	667	0.5135	0.13412
	≤ 50K	880	0.4998	0.13876
	≤ 100K	913	0.4946	0.14266
	ALL CASES	1133	0.4723	0.16315
STATE GRAD STUDENT TO COMMUNITY COLLEGE STUDENT RATIO	≤ 25K	645	0.3458	0.1736
	≤ 50K	855	0.3442	0.186
	≤ 100K	887	0.3449	0.1861
	ALL CASES	1101	0.3569	0.19536
% of total AA completions in Health field	≤ 25K	664	0.1761	0.12284
	≤ 50K	873	0.1756	0.1254
	≤ 100K	906	0.1763	0.12594
	ALL CASES	1030	0.1751	0.13757
% of total AA completions in arts and sciences fields	≤ 25K	664	0.4399	0.24328
	≤ 50K	874	0.4405	0.24653
	≤ 100K	907	0.4356	0.24776
	ALL CASES	1034	0.4256	0.25777
% of total AA completions in trades	≤ 25K	664	0.0366	0.0714
	≤ 50K	872	0.0386	0.06976
	≤ 100K	903	0.04	0.0728
	ALL CASES	1030	0.0418	0.07762
% of total AA completions in Business	≤ 25K	667	0.1355	0.09498
	≤ 50K	880	0.133	0.09478
	≤ 100K	913	0.1327	0.09416
	ALL	1065	0.1511	0.15011

	CASES			
% of total AA completions in Computing	≤ 25K	667	0.0491	0.06776
	≤ 50K	880	0.0491	0.06446
	≤ 100K	913	0.0497	0.06454
	ALL CASES	1065	0.0502	0.07336
PART-TIME FACULTY WAGE (IMPLICIT)	≤ 25K	668	15530.95	5113.75
	≤ 50K	881	19762.77	9259.96
	≤ 100K	914	21492.97	13028.05
	ALL CASES	972	39717.66	219572.32
AVERAGE SALARY OF FULL-TIME INSTRUCTIONAL FACULTY	≤ 25K	641	49580.51	11669.022
	≤ 50K	851	50212.57	11758.599
	≤ 100K	883	50023.32	11691.308
	ALL CASES	996	49391.18	11712.395
OPERATING REVENUE PER FTE	≤ 25K	668	4413.81	3785.139
	≤ 50K	881	4571.17	3522.046
	≤ 100K	914	4653.69	3520.365
	ALL CASES	1055	5906.14	20564.298

Additional variables were generated to match those found significant in the prior research by Zhang and Liu (2007) that examined four-year institutions. These included the percentage of part-time students in relation to total student enrollment (% PT Student), the percentage of part-time to all instructors (% PT Faculty), total revenue per student (Rev Per FTE), and location. To further work conducted by Dobbie and Robinson (2007), collective bargaining data was developed by the *Directory of Faculty Contracts and Bargaining Agreements*. The directory permitted the construction of dummy variables indicating the presence of a bargaining agreement, and whether the bargaining unit contained any part-time faculty (PT Union).

Because part-time faculty ratios and wages likely depend upon disciplines, indicators for faculty employment in these fields were constructed. In the absence of data on faculty qualifications, we calculated the percentage of graduates in five fields (arts & sciences, health, business, computing and trades).

On the premise that the flow of graduate students may affect the market for contingent academic labor, we developed a measure of the supply of graduate students relative to the number of community college students. To ascertain this ratio we used state enrollment statistics obtained from the Digest of Educational Statistics (Table 203) for 2004.

Finally, Carnegie Codes were used to indicate whether a school is urban. We also used the NCES regional designations to group states. Schools were designated "Urban" and assigned 1 if their Carnegie Code for location was either 5 or 7. All other codes were assigned a 0 for this variable. On a separate dummy variable for rural community colleges, schools were assigned a 1 if their Carnegie Code was 1, 2 or 3.

Methods and Theory

Standard demand and supply analysis employs regression techniques to estimate the effects of underlying determinants. Demand for part-time faculty can principally be understood in terms of the substitution of one good for another, given changes in relative wage rates. Because part- and full-time faculty are employed as substitutes for one another, we expect the rate at which employers hire part-time faculty to rise as the part-time wage falls relative to that of the full-time faculty. In the absence of a reliable part-time wage estimate at the institutions they examined, prior analysis by Zhang and Liu (2007) examined only full-time earnings (logged) and found that demand for part-time instructors rises as the full-time faculty wage rate increases. In addition to wages, they also found that urban campuses employ more part-time faculty, that schools with large numbers of part-time students are apt to have higher part-time faculty ratios, that revenue per FTE reduces part-time faculty ratios, and that the ratio of part-time faculty rises when enrollment declines. Variants of these variables are included in our analysis. For regression analyses we took the log of operating revenue per FTE and enrollment in order to normalize their distributions, and also because doing so allows for easier interpretation of regression coefficients.

The current study replicates Zhang and Liu's results within the context of community colleges, with the addition of the part-time wage data developed for this study. We also include collective bargaining variables so as to explore union effects. Two variables were retrieved from the Center for the Study of Collective Bargaining in Higher Education's 2005-06 Directory, which details bargaining data for U.S. colleges. This database indicates whether part-time faculty or adjuncts are considered members of a bargaining unit. Additionally, the year of the unit's first contract is available and was used to determine whether the collective bargaining arrangements were present in 2004-05. The variable defined as Part-time Union is coded with a 1 if any part-time faculty participate in contract deliberations, and 0 if not. Likewise the Bargaining Agreement variable is coded 1 if a collective bargaining agreement was in place during 2002-03.

Finally, this study makes a novel contribution through its examination of the supply of graduate students. We ask whether there are notable effects upon employment when the number of graduate students is large relative to community college enrollment. This variable is created using totals of graduate student enrollment expressed as a percentage relative to total community college enrollments in each state.

Thus basic equation to be estimated using OLS regression analysis takes the following form:

Part-time Faculty Percentage =
B_o or Constant
B_1 Wage Measures
B_2 Part-Time Students as % of All CC Students (PT Stdnt)
B_3 Log of Student Enrollment (Log Enrollmt)
B_4 Log of Revenue per student (Log Rev)
B_5 Part-time faculty participation in bargaining unit (PT Union)
B_6 Bargaining Agreement
B_7 Urban Location
B_8 State Graduate Students as % to CC Students (Grad Students)
B9 Field of Instruction (as measured by % of degrees awarded)

Tables 3 and 4 report separate analyses. Table 3 reports three regression analyses in which the part-time faculty wage is included as a percentage of full-time faculty wages. The three regressions involve subgroups of the full set of institutions defined as those schools in which wages were less than or equal to $25,000, $50,000, and $100,000. Because wages are likely to be influenced by union and other variables that may be modeled in another equation, a final analysis is reported in Table 4, in which two-stage least squares regression analysis is deployed to address potential endogeneity which could produce a simultaneity bias for regression coefficient estimates.

Before proceeding to the results, it is appropriate to summarize our expectations. First, we expect that as the ratio of wages for part-time faculty decline relative to those of full-time faculty, colleges will substitute additional part-time for full-time faculty (or $B_1<0$). Second, where we find a high percentage of part-time students we expect more students to attend evening or weekend classes that institutions typically prefer to staff flexibly using part-time faculty (or $B_2>0$). Based upon Liu and Zhang's results, low student enrollment is expected to have higher part-time faculty ratios (or $B_3<0$). Assuming that full-time faculty are preferred to part-time faculty, we expect that higher operating revenue should enable lower part-time faculty ratios (or $B_4<0$). A priori expectations regarding the union variables are less clear, and we are primarily interested to find out what effect, if any, these variables have. It should be noted that unions could exert two forms of pressure; one of these is captured separately by the wage variable, while the other involves hiring practices. Urban schools are expected to have less difficulty securing supplies of adjunct faculty, and because of this are expected to prefer the flexibility they obtain by hiring more part-time faculty (or $B_7<0$). We expect that increases in the number of graduate students relative to a state's community college population increases supply of part-time instructors (or $B_8>0$). Finally, we expect that employment in professional disciplines is likely to be associated with higher levels of part-time faculty ($B_8<0$).

Results

As indicated in Table 3 and 4, the results closely match our expectations. Most importantly, we find the expected response to the relative wage rates of part-time faculty. When the ratio of part- to full-time faculty earnings falls by 10 percentage points, the ratio of part- to full-time employment increases by approximately 2%. This finding is statistically significant at $P<.001$, regardless whether the regression analysis includes only those cases in which part-time faculty wages were found to be less than or equal to $25,000 or the larger set of institutions including those with wages up to and including $100,000.[3] Rather than decrease, as might be expected, the significance level rises considerably with the inclusion of additional cases.

[3] To see how sensitive our results were to the removal of all cases in which part-time wages exceeded 100,000 or were negative, the regression model found in Table 3 was run on all 905 cases for which data was available. This produced much the same result as the third regression, except that the wage ratio t-statistic decreased to 11.35 and the adjusted R Square was reduced back to .368. The only significant change was that the coefficient on the percentage of students graduating in business became significant.

As expected, greater total operating revenue per student is associated with decreased reliance upon part-time faculty. Contrary to the Zhang and Liu (2007) analysis, greater enrollment was significantly linked to higher part-time employment ratios.

Table 3 also permits some statements regarding the impact of collective bargaining upon the level of part-time employment. The existence of a collective bargaining agreement is significantly associated with greater part-time faculty. However, the coefficient is negative (and also significant) for the variable indicating that part-time faculty participate in the institution's union. This tells us that the participation of part-time faculty in an institution's collective bargaining is associated with a reduction their percentage of total employment. Because the coefficient for part-time union participation is slightly higher than that of overall bargaining effect, the effect is to more than cancel out the higher part-time ratios associated with collective bargaining.

TABLE 3
Determinants of Part-time to Full-time Faculty Ratio at All Public 2-year Colleges for 2004--grouped by Part-time Wage: Regression Results

	PT Wage ≤ 25K (n=617)		PT Wage ≤ 50K (n=824)		PT Wage ≤ 100K (n=855)	
Independent Variables	*B*	*T*	*B*	*t*	*B*	*t*
(Constant)	0.5170	5.39***	0.5920	7.276***	0.6240	7.726***
WAGEPCT	-0.179	-5.495***	-0.228	-13.432***	-0.211	-17.268***
Bargaining Agreement (y/n)	0.0365	3.018**	0.0381	3.452***	0.0396	3.545***
PT Union	-0.04388	-3.179**	-0.03925	-3.231***	-0.03826	-3.118**
PT Students	0.3200	9.903***	0.2660	9.449***	0.2740	9.81***
Graduate to CC Stdnts	0.1430	5.749***	0.1050	5.2***	0.0933	4.646***
Ln Operating Revenue FTE	-0.03932	-2.089*	-0.04064	-2.444*	-0.0413	-2.473*
Ln Fall Headcount Enrollment	0.0166	3.162**	0.0115	2.555*	0.0082	1.8190
% Degrees in Computing	0.2390	2.8580**	0.2980	3.894***	0.3300	4.343***
% Degrees in Health	-0.0054	-0.1090	0.0017	0.0420	-0.0165	-0.4170
% Degrees in Arts and Science	0.0113	0.3050	0.0390	1.2630	0.0318	1.0590
% Degrees in Trades	-0.178	-2.3*	-0.0804	-1.1840	-0.162	-2.544*
% Degrees in Business	0.0842	1.2420	0.0796	1.4070	0.0659	1.1780
Urban Location	-0.0189	-1.6530	-0.0070	-0.7040	-0.0061	-0.6130
R	0.5910		0.6450		0.7040	
R-square	0.3500		0.4150		0.4960	
Adj. R-square	0.3360		0.4060		0.4880	
SEE	0.0936		0.0961		0.0980	
F	24.942***		44.275***		63.727***	

*** p<.001, ** p<.01, * p<.05

One of the most significant variables in our analysis is the ratio of part-time students. As has been found in previous analyses, as the ratio of part- to full-time students rises, so does the ratio of part-time faculty. A 10 percentage point increase in part-time students is associated with an approximately 3% increase in part-time faculty across our three regression analyses.

However, the statewide ratio of graduate students to community college enrollment proved highly significant across all regressions. A 10% increase in the graduate student ratio corresponds with a more than 1% increase in the part-time faculty ratio.

Among the other characteristics we investigated, only the percentages of graduates in computing and the trades were found to be significant. The coefficient on computing was positive, while that corresponding with the trades was negative. Percentage of graduates in arts and science and health were found to be statistically insignificant. So, too, was an urban location.

In general, the various regressions were quite consistent. Unlike most of the other variables, the effect of LOG REV became less significant as additional cases were added into Table 3. Likely this is because the financial reports of the marginal schools are more dubious.

Table 4 presents the results of two-stage least squares analyses. A preliminary analysis was conducted in which all the variables from table one were included in the second-stage regressions, while one instrument was added (rural locations) permitting a first-stage regression. In this original analysis the same variables reported in Table 3 were insignificant. Because we believe those variables are related to the wage equations and thus contribute to the possibility of bias resulting from simultaneity, those variables (% of graduate in the business, % of graduates in health, % of graduates in arts and science subjects, and urban location) were excluded from the list of explanatory variables, but included as instruments in the first-stage regression.

TABLE 4
Determinants of Part-time to Full-time Faculty Ratio at All Public 2-year Colleges for 2004--grouped by Part-time Wage: 2-stage Least Squares Regression Results

	PT Wage ≤ 25K (n=617)		PT Wage ≤ 50K (n=824)		PT Wage ≤ 100K (n=855)	
Independent Variables	*B*	*t*	*B*	*t*	*B*	*t*
WAGEPCT	-0.1827	-5.658***	-0.2313	-13.708***	-0.2143	-17.721***
Bargaining Agreement (y/n)	0.0372	3.074**	0.0384	3.49***	0.0401	3.598***
PT UNION	-0.0447	-3.249***	-0.0384	-3.18***	-0.0371	-3.043***
PT STUDENTS	0.3178	9.973***	0.2647	9.512***	0.2717	9.853***
Graduate to CC Students	0.1485	6.242***	0.1033	5.332***	0.0903	4.677***
Ln Operating Revenue FTE	-0.0159	-1.965*	-0.0180	-2.539**	-0.0184	-2.58**
Ln Fall Headcount Enrollment	0.0128	2.628**	0.0108	2.562**	0.0078	1.8360
% Degrees in Computing	0.2508	3.562***	0.2618	4.032***	0.3008	4.644***
% Degrees in Trades	-0.1831	-2.662**	-0.1185	-1.978*	-0.1921	-3.393***
(Constant)	0.5505	6.315***	0.6333	8.438***	0.6559	8.745***
Multiple R	0.5868		0.6421		0.7024	
R-square	0.3443		0.4123		0.4934	
Adj. R-square	0.3346		0.4058		0.4880	
Standard Error	0.0937		0.0961		0.0980	
F	35.41235***		63.45646***		91.44853***	

Unobservable instruments in the first stage: Urban Location, Rural Location, % Degrees in Health, % Degrees in Arts and Sciences, % Degrees in Business

As indicated in Table 4, we obtained very similar results, especially with regard to the signs and magnitudes of all the coefficients. In the first regression, in which the cases were restricted to those where part-time wages were calculated to be less than or equal to $25,000, the estimate for the coefficient of log operating revenue per FTE was just outside the 5% significance level ($p<.0504$). That coefficient, however, increased in significance with the addition of new cases. By contrast, the Log of FTE enrollment began as significant in the group with the smallest number of cases, but became insignificant ($p<.067$) as we moved to the analysis that included a greater number of cases. Overall, however, this analysis increased confidence in our prior findings.

As indicated by the Adjusted R Square in both two-stage and ordinary least squares analyses, the percentage of variation explained by the regression analyses rose from approximately 33% to just under 50% as the number of cases in our analyses was extended.

Discussion

While not wholly unexpected, the results reported here deepen our understanding of the operation of contingent labor markets in academia. First, the results add evidence affirming arguments that part-time faculty are hired for economic reasons. By examining the impact of student fields of study, we do, however, find limited evidence that part-time faculty may be hired to secure the benefits of working practitioners. However, this is only true for computing and information science, and not for business or health. Perhaps surprisingly, as the percentage of students graduating in arts and sciences increases, we do not find that the ratio of part- to full-time faculty increases. Thus our conclusion is that the motivations—economic versus professional expertise—for increased hiring are not mutually exclusive, though the evidence for the latter is limited to one specific field. In fact, we find that securing instructors in the trades appears to require greater full-time employment.

Second, the evidence here suggests that unions play an intriguing role in the increasing tendency among community colleges to raise contingent employment levels. Independent of wage—upon which unions do exert upward influence—collective bargaining is associated with higher levels of part-time employment, except when part-time faculty are members of unions. This finding is striking and suggests the need for further study into contract language. Some part-time faculty members challenge unions for failing to represent their interests; our findings suggest there could be truth in this assertion. In particular, if unions raise the cost of hiring full-time and possibly tenure-track faculty (whether through protections or rules that colleges find costly), institutions may prefer to hire more unprotected part-time faculty. This explanation is consistent with the finding that including part-time faculty in collective bargaining reduces institutional reliance upon contingent faculty. We can presume that the rationale for this is that even if contingent faculty do not receive better wages, when they obtain voices in their unions they may obtain increased protection, reducing the advantages colleges might otherwise obtain through their hire. It is important to note that these union effects must be distinguished from their effect upon part- and full-time wages, as the effect of the relative wage is measured separately.

A third finding is the appearance of strong linkages between graduate school enrollment and contingent employment. This is a particularly worrisome phenomenon if graduate schools wish to advance the interests of their students.

Finally, the current study suggests that the community colleges' drive toward flexibility is an important motive for hiring part-time faculty. Not only is this indicated through the union coefficients, but also because of the highly significant coefficient on part-time student enrollment. As reported by Zhang and Liu, the ratio of part-time faculty rises when part-time students increase, presumably because these students are more likely to demand classes in the evening or on weekends, times when full-time faculty generally prefer not to teach. We are also interested in the difference between our finding and Zhang and Liu's regarding school size. Contrary to their finding, our data suggests that larger schools seek greater levels of part-time employment, even though we can imagine it would be easier to combine teaching assignments for specialized courses when there is greater student enrollment.

A final caveat is in order. While the production of an institutional average for part-time faculty is a significant achievement, there is one theoretical problem involved in its usage. Just as our results show that part-time faculty employment ratios increase with lower wages relative to faculty, so too should we expect that the number of courses taught by an average part-time instructor increase as their wages drop. If this is the case, institutional averages for part-time faculty earnings are likely to represent different levels of work conducted by typical instructors. Schools with lower part-time faculty averages may thus actually give the appearance that faculty members are paid more than they actually are, if their pay is calculated on a per course basis. More finely grained analyses of part-time employment are merited to mitigate this problem.

To conclude, the analysis presented here demonstrates which variables are most likely to influence a school's part-time employment rate. The results suggest that raising wage rates for part-time faculty may be the surest way of reducing part-time faculty ratios. Second, a close examination of state production of graduate students should be pursued to enable graduate schools to determine what is in the best interests of their students. Finally, our evidence suggests that unions can play significant roles in altering the contingent academic labor landscape. Particularly when unions include part-time faculty in their membership, we are likely not only to see increases the part-time wage relative to that of full-time faculty, but perhaps more importantly, conditions that both improve the lot of part-time faculty and simultaneously reduce the demand that creates a unequal or second-class status within academia. This is important not only for the faculty themselves, but also for community college students who are likely to be shortchanged when their instructors are treated unequally.

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